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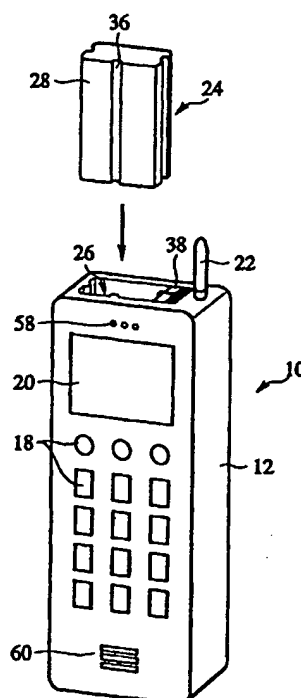
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## (54) Telephone transmitting/receiving unit and mobile communication terminal

(57) A telephone transmitting/receiving unit (24) comprising an electronic circuit having a function of converting a signal received by an antenna (22,42) to signal to be output by a speaker (58), a function of converting a voice signal input by a microphone (60) to a signal to be output by the antenna (22), a function of performing prescribed processing based on a signal from an operational unit (70), a function of generating a signal to be displayed in a display unit (20), a cartridge (28) for removable loading in a slot (26) formed in a mobile communication terminal (10,78,88,94), and an input/output unit (30) for inputting/outputting a signal to/from the mobile communication terminal. The telephone transmitting/receiving unit (24) is loaded in the mobile communication terminal (10,78,88,94), whereby mobile communication can be performed by the use of the mobile communication terminal. The telephone transmitting/receiving unit (24) is applicable to various types of mobile communication terminals, so that mobile communication can be provided suitable to a time, place and occasion without employing a plurality of circuits but by employing a single circuit.

FIG. 1



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## Description

### BACKGROUND OF THE INVENTION

The present invention relates to a telephone transmitting and receiving unit, a mobile communication relay terminal and a mobile communication terminal which can realize comfortable mobile object communication suitable to a time, place and occasion without employing a plurality of circuits. The present invention also relates to a communication service system in which contents of received electronic mail can be learned without the use of a communication terminal which can display data of electronic mail as text.

Recently, as prices of machines and instruments for mobile communication and its service fees have been reduced, subscribers to mobile communication have increased. The increase of subscribers to portable telephones, PHS (Personal Handy phone System) etc. is remarkable. As mobile computers etc. prevail, connections of portable telephone terminals and PHS terminals to mobile computers for data communication are increasing. It is considered that the number of subscribers to mobile communications will further increase.

Recently, PHS-integrated terminals including PHS terminals and PDAs (Personal Digital Assistants) integrated with each other have been marketed, and a single terminal can accommodate services of telephone communication, electronic mail, etc.

However, mobile communication uses electrical waves of an allocated frequency band. In an allocated frequency band only a set number of circuits can be provided. Accordingly, if subscribers continue to increase in number as they have done, a problem that the subscribers will exceed a circuit providing capacity limit will occur.

While the PHS-integrated terminal can realize various functions, the PHS-integrated terminal is inconveniently large to carry in comparison with the PHS terminal and the portable telephone terminal, and some users employ different circuits for the PHS terminal and the portable telephone terminal to use the PHS-integrated terminal and PHS terminal as appropriate. To comfortably use mobile communication suitable for TPO (Time, Place, Occasion), circuit service fees must be paid for the respective circuits, which much burdens the users. This is also a problem.

In the conventional communication service, because PHS terminals, portable telephone terminals etc. have no function of displaying data of electronic mail as text, users cannot know the contents of received electronic mail.

### SUMMARY OF THE INVENTION

An object of the present invention is to provide a telephone transmitting/receiving unit and a mobile communication terminal which can realize mobile

communication suitable to a time, place and occasion without employing a plurality of circuits.

Another object of the present invention is to provide a telephone transmitting/receiving unit, a mobile communication relay terminal and a mobile communication terminal which can realize mobile communication suitable to a time, place and occasion without employing a plurality of circuits.

Further another object is to provide a communication service system in which even by the use of a communication terminal having no function of displaying data of electronic mail as text a user can know contents of received electronic mail.

The above-described objects are achieved by a telephone transmitting/receiving unit comprising: an electronic circuit having a function of converting a received signal received by an antenna to a voice signal to be output by a speaker, a function of converting a voice signal input to a microphone to a transmitted signal to be output by the antenna, a function of conducting prescribed processing based on an operational signal from an operational unit, and a function of generating a display signal to be displayed in a display unit; a cartridge including the electronic circuit for removable loading in a slot formed in a mobile communication terminal; and an input/output unit included in the cartridge for inputting/outputting a signal to/from the mobile communication terminal. The telephone transmitting/receiving unit is loaded in the mobile communication terminal to allow mobile communication to be performed by the use of the mobile communication terminal. The telephone transmitting/receiving unit is applicable to various types of mobile communication terminals, so that mobile communication can be provided suitable to a time, place and occasion without employing a plurality of circuits but by employing a single circuit.

The above-described objects are achieved by a mobile communication terminal comprising: an antenna for transmitting/receiving a signal to/from a base station; a speaker for outputting a voice signal; a microphone for inputting a voice signal; an operational unit for generating an operational signal based on an operation; a display unit for display based on a display signal; a slot for receiving the above-described telephone transmitting/receiving unit; and an input/output unit included in the slot for inputting/outputting a signal to/from the telephone transmitting/receiving unit. The telephone transmitting/receiving unit is loaded in the mobile communication terminal to allow mobile communication to be performed by the use of the mobile communication terminal. The telephone transmitting/receiving unit is applicable to various types of mobile communication terminals, so that mobile communication can be provided suitable to a time, place and occasion without employing a plurality of circuits but by employing a single circuit. The above-described mobile communication terminal does not have to include the electronic circuit formed in the telephone transmitting/receiving unit,

which contributes to lower costs of the mobile communication terminal.

The above-described object is achieved by a mobile communication relay terminal comprising: an antenna for transmitting/receiving a signal to/from a base station; a slot for receiving the above-described telephone transmitting/receiving unit; an input/output unit disposed in the slot for inputting/outputting a signal to/from the telephone transmitting/receiving unit; and a unit for transmitting/receiving a signal to/from a mobile communication terminal. The mobile communication relay terminal includes a slot for receiving the telephone transmitting/receiving unit, whereby transmitted/received signals are relayed by the mobile communication relay terminal to perform mobile communication by use of the mobile communication terminal. The mobile communication terminal can be smaller-sized, which provides mobile communication suitable to a time, place and occasion.

The above-described object is achieved by a mobile communication terminal comprising: a microphone for inputting a voice signal; a speaker for outputting a voice signal; and a unit for transmitting/receiving a signal to/from the above-described mobile communication relay terminal. The mobile communication relay terminal includes a slot for receiving the telephone transmitting/receiving unit, whereby transmitted/received signals are relayed by the mobile communication relay terminal to perform mobile communication by the use of the mobile communication terminal. The mobile communication terminal can be smaller-sized, which provides mobile communication suitable to a time, place and occasion.

It is preferable that the mobile communication terminal is a portable telephone, a personal handy phone, a personal digital assistant or a mobile computer.

It is preferable that the mobile communication terminal is in the form of a wrist watch, a spectacle frame, a fountain pen, a key holder, a lighter or a pendant.

The above-described object is achieved by a communication service system for receiving data and, when the received data is electronic mail data, converting the electronic mail data to a voice signal, and transmitting the voice signal to a communication terminal. Electronic mail data is converted to a voice for transmission, whereby even by the use of a communication terminal having no function of displaying electronic mail data as text, a communication service system which enables contents of electronic mail to be known can be provided.

In the above-described communication service it is preferable further to store the voice signal temporarily in a memory unit, and to transmit the voice signal to the communication terminal in response to a command of the communication terminal.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the telephone trans-

mitting/receiving unit and the mobile communication terminal according to a first embodiment of the present invention.

FIG. 2 is a detailed perspective view of the telephone transmitting/receiving unit and the mobile communication terminal according to the first embodiment of the present invention.

FIG. 3 is a block diagram of a circuit of the telephone transmitting/receiving unit and the mobile communication terminal.

FIG. 4 is a perspective view of the telephone transmitting/receiving unit and the mobile communication terminal according to a second embodiment of the present invention.

FIG. 5 is a perspective view of the telephone transmitting/receiving unit and the mobile communication terminal according to a third embodiment of the present invention.

FIG. 6 is a perspective view of the telephone transmitting/receiving unit, the mobile communication relay terminal and the mobile communication terminal according to a fourth embodiment of the present invention.

FIG. 7 is a perspective view of the telephone transmitting/receiving unit, the mobile communication relay terminal and the mobile communication terminal according to a fifth embodiment of the present invention.

FIG. 8 is a block diagram of the communication service system according to a sixth embodiment of the present invention.

#### DETAILED DESCRIPTION OF THE INVENTION

##### First Embodiment

The telephone transmitting/receiving unit and the mobile object communication terminal according to a first embodiment of the present invention will be explained with reference to FIGs. 1 to 3. FIG. 1 is a perspective view of the telephone transmitting/receiving unit and the mobile communication terminal according to the present embodiment. FIG. 2 is a detailed perspective view of the telephone transmitting/receiving unit and the mobile communication terminal. FIG. 3 is a block diagram of a circuit of the telephone transmitting/receiving unit and the mobile communication terminal according to the present embodiment.

As shown in FIG. 1, on one side of a body 12 of a PHS terminal 10 there are provided a speaker 58 and a microphone 60 which in use are respectively brought near to an ear and the mouth of a user.

Operational buttons 18 by which telephone numbers and required operations are input, and a liquid crystal display unit 20 for displaying an input telephone number, an operational state, etc. are provided also on the side of the body 12.

In the upper surface of the body 12 there is pro-

vided a transmitting/receiving antenna 22 for transmitting and receiving signals to/from base stations; and a slot 26 for removably receiving a telephone transmitting/receiving unit 24 is formed also in the upper surface of the body 12. FIG. 2 details the telephone transmitting/receiving unit 24 and the slot 26.

A cartridge 28 of the telephone transmitting/receiving unit 24 accommodates an electronic circuit (see FIG. 3). On the cartridge 28 there are formed input/output terminals 30 for supplying electric power from the PHS terminal 10 to the electronic circuit and inputting/outputting signals to/from the PHS terminal 10. The input/output terminals 30 are formed so that when the telephone transmitting/receiving unit 24 is inserted in the slot 26, they are connected to input/output terminals 32 formed in the slot 26. A groove 36 is formed in the cartridge 28 so as to receive a guide rail 34 formed in the slot 26. The guide rail 34 and the groove 36, which are formed so that the former is received in the latter, can prevent erroneous insertion of the telephone transmitting/receiving unit 24.

A lock mechanism constituted by a slide button 38 and a spring (not shown) is provided near an insertion opening of the slot 26. FIG. 2 shows the slide button 38 slid in the direction of the arrow. When the slide button 38 is slid in the direction of the arrow, the slide button 38 is biased by the spring in the direction opposite to the direction of the arrow. When the telephone transmitting/receiving unit 24 is inserted into the slot 26, as shown in FIG. 2, the slide button 38 is slid in the direction of the arrow to open the insertion opening, and the telephone transmitting/receiving unit 24 is inserted. Then, when a force which has urged the slide button 38 in the direction of the arrow is weakened, the slide button 38 is returned by the spring back to the usual position. The inserted telephone transmitting/receiving unit 24 is secured by the slide button 38.

Next, with reference to FIG. 3, a circuit of the telephone transmitting/receiving unit 24 and the PHS terminal 10 will be explained.

The telephone transmitting/receiving unit 24 and the PHS terminal 10 according to the present embodiment is applicable to the digital communication of PDC (Personal Digital Cellular system), which is commonly used in Japan.

In FIG. 3, the constituent parts in the one-dot-chain line are included in the telephone transmitting/receiving unit 24, and the constituent parts in the dotted lines are included in the PHS terminal 10.

The constituent parts in the one-dot-chain line are universally used in various types of mobile communication terminals and are included in their telephone transmitting/receiving units 24. The constituent parts in the dotted lines are those, such as the transmitting/receiving antenna 22 and the receiving antenna 42, that cannot have good characteristics when they are included in the telephone transmitting/receiving unit 24, and those, namely the liquid crystal display unit 20, the speaker 58,

the microphone 60, an operational unit 70 and a battery 76, that have different specifications among various types of mobile communication terminals and are included in the PHS terminal 10.

The PHS terminal 10 accommodates in the body 12 the receiving antenna 42 exclusively for receiving in addition to the transmitting/receiving antenna 22. The two systems of receiving antennas are thus provided so that the receiving antennas are suitably changed over to decrease receiving state changes, and this method is called diversity receiving method. The diversity receiving method can very effectively and stably receive signals from base stations even in multipass phasing due to interference among electric waves of different passes.

A receiving signal received by the transmitting/receiving antenna 22 is input to a receiver 46 via transmitting/receiving unit 44. A signal of a prescribed frequency is input to the receiver 46 from a digital loop preset synthesizer 48. The receiver 46 conducts prescribed signal processing on the received signal input by the transmitting/receiving unit 44 by the use of the signal of the prescribed frequency input by the digital loop preset synthesizer 48 and outputs the signal to a demodulator 50. The transmission/reception to/from base stations uses a TDMA (Time Division Multiple Access) method. The TDMA method uses an allocated time to each frame by dividing the same. In the TDMA method the mobile communication terminal uses a vacant time slot between intermittently transmitted or received burst signals to instantaneously measure a receiving electric field intensity between neighboring base stations to find base stations which can be reliably communicated with, so that the digital loop preset synthesizer 48, which can instantaneously complete change-over of a channel, is used.

A receiving signal received by the receiving antenna 42 is input to a receiver 52. A signal of a prescribed frequency is input to the receiver 52 by the digital loop preset synthesizer 48. The receiver 52 conducts prescribed signal processing on the signal received from the receiving antenna 42 by the use of the signal of the prescribed frequency from the digital loop preset synthesizer 48 and outputs the signal to a demodulator 50.

The demodulator 50 modulates selectively the signal input by the receiver 46 and the signal input by the receiver 52, and outputs the selected signal to a TDMA circuit 54. The TDMA circuit 54 has functions of multiplexing signals, separating signals, correction, confidential processing, etc.

The TDMA circuit 54 conducts prescribed processing on the signal input by the demodulator 50 and outputs the signal to a CODEC (COder-DECoder) 56. The CODEC 56 converts the digital signal input by the TDMA circuit 54 to an analog speech signal and outputs the signal to the speaker 58. The speaker 58 outputs the input speech signal as a speech. The speech output

by the speaker 58 is transmitted to an ear of the user.

On the other hand, speech uttered from the mouth of the user is converted to a speech signal by the microphone 60 and input to the CODEC 56. The CODEC 56 converts the speech signal from the microphone 60 to a digital signal and outputs the signal to the TDMA circuit 54.

The signal input to the TDMA circuit 54 by the CODEC 56 is subjected to the prescribed processing by the TDMA circuit 54 and output to a waveform shaper 62. The signal input to the waveform shaper 62 is shaped and output to a D.C.-A.C. modulator 64. The D.C.-A.C. modulator 64 modulates the signal input by the waveform shaper 62 by a  $\pi/4$  shift QPSK (Quaternary Phase-Shift Keying) modulation method by the use of a signal of the prescribed frequency input from the digital loop preset synthesizer 48. The use of the  $\pi/4$  shift QPSK modulation method can improve transmission efficiency.

The signal modulated by the D.C.-A.C. modulator 64 is output to an electric power amplifier 68. The electric power amplifier 68 has high linear amplification and can well amplify the  $\pi/4$  QPSK modulated wave.

The signal amplified by the electric power amplifier 68 is transmitted to a base station from the transmitting/receiving antenna 22 via the transmitting/receiving unit 44.

The operations of turning on/off the electric power and inputting a telephone number are performed with the operational buttons 18, illustrated as operational unit 70. When an operational signal is input to a control unit 72, the control unit 72 controls the electronic circuit, based on the input operational signal.

Display signals indicative of an operational state and telephone numbers etc. input by the operational unit 70 are output to the liquid crystal display unit 20 by the control unit 72.

Electric power is supplied to the electronic circuit from a battery 76 accommodated in the body 12.

As described above, according to the present embodiment the electric circuit having the above-described function is accommodated in the cartridge 28 which can be removably loaded in the slot 26 which is common with mobile communication terminals such as PHS terminals etc., whereby, when a PHS terminal is used for mobile communication, the mobile communication can be performed by loading the telephone transmitting/receiving unit in a cartridge 28 of the PHS terminal. The telephone transmitting/receiving unit can be loaded in various mobile communication terminals, so that mobile communication can be provided suitable to a time, place and occasion without employing a plurality of circuits but with employing a single circuit.

In the above-described mobile communication terminal it is not necessary to form the electronic circuit included in the telephone transmitting/receiving unit in the mobile communication terminal, which can contribute to low costs of the mobile communication terminal.

## Second Embodiment

The telephone transmitting/receiving unit and the mobile communication terminal according to a second embodiment of the present invention will be explained with reference to FIG. 4. FIG. 4 is a perspective view of the telephone transmitting/receiving unit and the mobile communication terminal according to the present embodiment. The parts of the telephone transmitting/receiving unit and the mobile communication terminal according to the present embodiment are represented by the same reference numbers as those according to the first embodiment to avoid repeating or to simplify their explanation.

The telephone transmitting/receiving unit 24 according to the present embodiment is the same as that according to the first embodiment. The present embodiment is different from the first embodiment in that in the present embodiment the mobile communication terminal is a mobile computer 78.

The mobile computer 78 includes, as shown in FIG. 3 inside the dotted line, a transmitting/receiving antenna 22, a receiving antenna (not shown), a speaker 58, a microphone 60, a liquid crystal display unit 20, an operational unit (not shown) and a battery (not shown).

FIG. 4 shows the mobile computer 78 with a lid 80 opened. A body 82 includes a plurality of keys 86 as an operational unit. A microphone 60 and a speaker 58 are disposed on the right side of the keys 86. The microphone 60 is tilted at a required angle to input speech uttered by a user. A slot 26 is formed in the front side of the body 82, which receives the telephone transmitting/receiving unit 24. A slide button 38 is formed in the slot 26 for securing the telephone transmitting/receiving unit 24.

On the lid 80 there are formed a liquid crystal display unit 20, a transmitting/receiving antenna 22 and a receiving antenna (not shown). When a communication is performed, a screen for inputting a telephone number, an electronic mail address etc., or for displaying an operational state etc. is displayed on the liquid crystal display unit 20.

As described above, according to the present embodiment, the slot is formed in the mobile computer, and when a mobile communication is performed by the use of the mobile computer, the telephone transmitting/receiving unit is loaded in the slot in the mobile computer, whereby mobile communication suitable to a time, place and occasion can be provided without employing a plurality of circuits.

## Third Embodiment

The telephone transmitting/receiving unit and the mobile communication terminal according to a third embodiment of the present invention will be explained with reference to FIG. 5. FIG. 5 is a perspective view of the telephone transmitting/receiving unit and the mobile

communication terminal according to the present embodiment. The parts of the telephone transmitting/receiving unit and the mobile communication terminal according to the present embodiment are represented by the same reference numbers as those according to the first or the second embodiment shown in FIGs. 1 to 4 to avoid repeating or to simplify their explanation.

The telephone transmitting/receiving unit 24 according to the present embodiment is the same as that according to the first or the second embodiment. The present embodiment is different from the first or the second embodiment in that in the present embodiment the mobile communication terminal is a PDA.

The PDA 88 includes a transmitting/receiving antenna 22, a receiving antenna (not shown), a speaker 58, a microphone 60 and a battery (not shown) as in FIG. 3, but the present embodiment includes a touch panel 90 which combines the liquid crystal display unit 20 and the operational unit 70 of FIG. 3.

The touch panel 90 is formed in a body 92 of the PDA 88, and the microphone 60 and the speaker 58 are disposed on the right side of the touch panel 90. A slot 26 is formed in the front side of the body 92 for receiving the telephone transmitting/receiving unit 24. A slide button 38 is disposed in the slot 26 for securing the telephone transmitting/receiving unit 24.

When a communication is performed, screens for inputting a telephone number, an electronic mail address, etc. are displayed on the touch panel 90. A user touches the touch panel 90 to input a telephone number, an electronic mail address, etc. Screens for displaying an operational state etc. are also displayed on the touch panel 90.

As described above, according to the present embodiment, the slot 26 is formed in the PDA 88, and when a mobile communication is performed by the use of the PDA, the telephone transmitting/receiving unit 24 is loaded in the slot 26 of the PDA, whereby the mobile communication can be performed. This permits mobile communication to be performed suitable to a time, place and occasion without employing a plurality of circuits.

#### Fourth Embodiment

The telephone transmitting/receiving unit, mobile communication relay terminal and mobile communication terminal according to a fourth embodiment of the present invention will be explained with reference to FIG. 6. FIG. 6 is a perspective view of the telephone transmitting/receiving unit, the mobile communication relay terminal and the mobile communication terminal according to the present embodiment. The parts of the telephone transmitting/receiving unit and the mobile communication terminal according to the present embodiment are represented by the same reference numbers as those according to the first to the third embodiments shown in FIGs. 1 to 5 to avoid repeating

or to simplify their explanation.

The present embodiment is characterized in that some of the constituent parts of the mobile communication terminal in the first to the third embodiments are instead included in the mobile communication relay terminal 94, whereby the mobile communication terminal is smaller-sized, and signals are relayed by the mobile communication relay terminal 94 to perform mobile communication. The telephone transmitting/receiving unit 24 according to the present embodiment is the same as the telephone transmitting/receiving unit according to the first to the third embodiments.

The mobile communication relay terminal 94 includes a slot 26, a transmitting/receiving antenna 22, a receiving antenna (not shown), a battery (not shown), an electronic circuit (not shown) for performing prescribed signal processing and a transmitting/receiving antenna 96 for transmitting/receiving signals to/from a mobile communication terminal 98. The mobile communication relay terminal 94 is sufficiently small-sized to be carried in a bag or the like. The slot 26 has the same constitution as the slots 26 of the first to the third embodiments. A slide button 38 is disposed in the slot 26 for securing the telephone transmitting/receiving unit 24.

As shown in FIG. 6, the mobile communication terminal according to the present embodiment is a wrist watch 98. In a body 100 of the wrist watch 98 there are provided a transmitting/receiving antenna (not shown) for transmitting/receiving signals to/from the mobile communication relay terminal 94 and an electronic circuit (not shown) for performing prescribed processing. Operational buttons 18, a liquid crystal display unit 20, a speaker 58 and a microphone 60 are formed on the upper surface of the body 100. When a mobile communication is performed, screens for inputting a telephone number, an electronic mail address, etc. are displayed on the liquid crystal display unit 20. A user performs prescribed operations by pressing the operational buttons 18 to input a telephone number, an electronic mail address, etc. Screens for displaying a date and time, an operational state, etc. are displayed on the liquid crystal display unit 20.

The liquid crystal display unit 20 may be replaced by a touch panel, so that a telephone number, an electronic mail address etc. are input by a touch pen.

As described above, according to the present embodiment, the slot is formed in the mobile communication relay terminal 94, whereby when mobile communication is performed by the use of the wrist watch 98, which is a small-sized mobile communication terminal, transmitted/received signals are relayed by the mobile communication relay terminal 94 to perform the mobile communication. This permits mobile communication to be performed by the use of a smaller-sized mobile communication terminal in the form of a wrist watch or the like suitable to a time, place and occasion.

### Fifth Embodiment

The telephone transmitting/receiving unit, the mobile communication relay terminal and the mobile communication terminal according to a fifth embodiment of the present invention will be explained with reference to FIG. 7. FIG. 7 is a perspective view of the telephone transmitting/receiving unit, the mobile communication relay terminal and the mobile communication terminal according to the present embodiment. The parts of the telephone transmitting/receiving unit, the mobile communication relay terminal and the mobile communication terminal according to the present embodiment are represented by the same reference numbers as those according to the first to the fourth embodiments shown in FIGs. 1 to 6 to avoid repeating or to simplify their explanation.

The telephone transmitting/receiving unit 24 and the mobile communication relay terminal 94 according to the present embodiment are the same as those according to the fourth embodiment. The present embodiment is different from the fourth embodiment in the mobile communication terminal.

As shown in FIG. 7, a body 104 of the mobile communication terminal 102 is mounted on an eyeglass frame 106. In the body 104 there are disposed an electronic circuit (not shown) for performing prescribed processes, a transmitting/receiving antenna (not shown) for transmitting/receiving signals to/from the mobile communication relay terminal 94 and a battery (not shown) for supplying electric power to the electronic circuit. A minimum number of operational buttons 18 are formed on the side surface of the body 104. A microphone 60 is formed on the body 104. The microphone 60 has a rod-shaped structure 108 for locating the microphone near the mouth of a user. The speaker disposed in an earphone 112 is connected to the electronic circuit formed in the body 104 through a wire. A user performs the mobile communication by putting the earphone 112 on an ear and inputting speech through the microphone 60.

As described above, according to the present embodiment, the mobile communication terminal 102 is mountable on an eyeglass frame 106, whereby mobile communication can be provided suitable to a time, place and occasion.

### Sixth Embodiment

A communication service system according to a sixth embodiment of the present invention will be explained with reference to FIG. 8. FIG. 8 is a block diagram of the communication service system according to the present embodiment.

The present embodiment is characterized by the communication service that the telephone transmitting/receiving unit, the mobile communication relay terminal, the mobile communication terminal, etc.

according to the first to the fifth embodiments of the present invention are used to convert electronic mail data to voices to thereby transmit the communication.

As shown in FIG. 8, electronic mail data or a voice signal transmitted by a transmitter to a communication service company through a communication network is judged by a data/voice judging unit 114 as to whether or not it is electronic mail data or a voice signal, and when it is electronic mail data, the data is input to a data processing unit 116. The data processing unit 116 performs prescribed data processing on the input electronic mail data and outputs the data to a voice synthesizing unit 118. The voice synthesizing unit 118 converts the input data to voice signals and outputs the voice signals to center system 120. The center system 120 stores the input voice signals in a memory unit (not shown).

A voice signal which has been judged to be a voice by the data/voice judging unit 114 is input to a voice processing unit 122. The voice processing unit 122 performs prescribed processing the input voice signal and outputs the voice signal to the center system 120. The center system 120 stores the input voice signal in the memory unit.

When a user wants to know the contents of electronic mail, he/she accesses the center system 120 by the mobile communication terminal, and then the center system 120 transmits the voice signal stored in the memory unit to the mobile communication terminal or others of the user.

As described above, according to the present embodiment, even by the use of a mobile communication terminal or others having no function of displaying data of electronic mail as text, contents of the electronic mail addressed to a user can be known.

### Modifications

The present invention is not limited to the above-described embodiments and can cover other various modifications.

For example, in the first to the fifth embodiments, the electronic circuit provided in the cartridge is not limited to the above-described structure, and the constituent parts of the CODEC, the control unit, etc., for example, may be provided in the mobile communication terminal or the mobile communication relay terminal. Some of the constituent parts may be integrated or omitted, or other constituent parts may be added.

The first to the fifth embodiments use digital communication of a PDC method, but are not limited to the digital communication of the PDC method. Other digital communication methods may be used, and analog communication or others may be used.

The first embodiment uses a PHS terminal, but may use the usual portable telephone, car telephone, etc.

In the first to the fifth embodiments transmission and reception of signals can be performed not only



between PHS base stations, but also between all base stations, such as NTT(Nippon Telegraph and Telephone company) base stations and base stations of private circuits.

In the first to the fifth embodiments, the cartridge 5 has a substantially rectangular sectional shape but may have circular or elliptical sectional shape. By further integrating the electronic circuit the cartridge can be formed in the shape of a card, chip or the like.

In the first to the fifth embodiments the mobile communication terminal may be, e.g. notebook-type computers, electronic notebooks, portable DVD (Digital Versatile Disk) decks, etc. The mobile communication terminal may be mounted or incorporated in any object, such as a fountain pen, glove, key holder, lighter, uni- 10 form, pendant, etc.

In the first to the third embodiments, not only are telephone calls, electronic mail communication etc. made, but television telephone etc. using the liquid crystal display, the touch panel etc. may also be realized. 20

In the fourth and the fifth embodiments the mobile communication relay terminal may further include a liquid crystal display, an operational unit, etc.

In the first to the fifth embodiments, the input/output terminals are used for inputting/outputting signals 25 between the telephone transmitting/receiving unit and the mobile communication terminal, and between the telephone transmitting/receiving unit and the mobile communication relay terminal, but other methods, such as infrared communication, etc., may be used. 30

In the sixth embodiment, voice signals input from the voice synthesizing unit to the center system, and voice signals input from the voice processing unit to the center system need not be stored in the memory unit, but may be transmitted directly to a receiver. 35

In the sixth embodiment, the communication terminal used by a user is not limited to a mobile communication terminal, and the center system may be accessed by a usual telephone or others. 40

## Claims

1. A telephone transmitting/receiving unit (24) comprising:

an electronic circuit having a function of converting a received signal received by an antenna (22,42) to a voice signal to be output by a speaker (58), a function of converting a voice signal input to a microphone (60) to a transmitted signal to be output by the antenna (22), a function of conducting prescribed processing based on an operational signal from an operational unit (70), and a function of generating a display signal to be displayed in a display unit (20); 50

CHARACTERIZED BY:

a cartridge (28) including the electronic circuit

for removable loading in a slot (26) formed in a mobile communication terminal (10,78,88,94); and

an input/output unit (30) included in the cartridge (28) for inputting/outputting signals to/from the mobile communication terminal (10,78,88,94).

2. A mobile communication terminal (10,78,88) for use with a telephone transmitting/receiving unit (24) according to claim 1, comprising:

an antenna (22) for transmitting/receiving a signal to/from a base station;  
a speaker (58) for outputting a voice signal;  
a microphone (60) for inputting a voice signal;  
an operational unit (70) for generating an operational signal based on an operation;  
a display unit (20,90) for display based on a display signal;  
a slot (26) for receiving the telephone transmitting/receiving unit (24); and  
an input/output unit (32) included in the slot (26) for inputting/outputting signals to/from the telephone transmitting/receiving unit (24).

3. A mobile communication relay terminal (94) for use with a telephone transmitting/receiving unit (24) according to claim 1, comprising:

an antenna (22) for transmitting/receiving a signal to/from a base station;  
a slot (26) for receiving the telephone transmitting/receiving unit (24);  
an input/output unit (32) disposed in the slot (26) for inputting/outputting signals to/from the telephone transmitting/receiving unit (24); and  
a unit (96) for transmitting/receiving signals to/from a mobile communication terminal (98,102).

4. A mobile communication terminal (98,102) for use with a mobile communication relay terminal (94) according to claim 3, comprising:

a microphone (60) for inputting a voice signal;  
a speaker (58,112) for outputting a voice signal; and  
a unit for transmitting/receiving a signal to/from the mobile communication relay terminal (94).

5. A mobile communication terminal (10,78,88) according to claim 2, wherein the mobile communication terminal is a portable telephone, a personal handy phone, a personal digital assistant or a portable computer.

6. A mobile communication terminal (98,102) accord-

ing to claim 4, wherein the mobile communication terminal is in the form of a wrist watch, a spectacle frame, a fountain pen, a key holder, a lighter or a pendant.

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7. A communication service system for receiving data and, when the received data is electronic mail data, converting the electronic mail data to a voice signal, and transmitting the voice signal to a communication terminal.

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8. A communication service system according to claim 7, for further storing the voice signal temporarily in a memory unit, and transmitting the voice signal to the communication terminal in response to a command of the communication terminal.

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FIG. 1

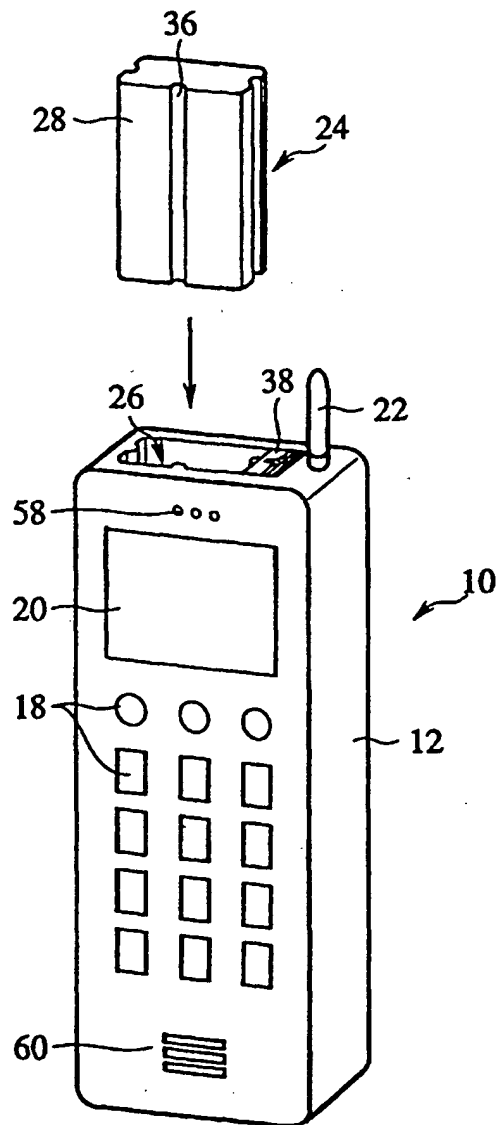


FIG. 2

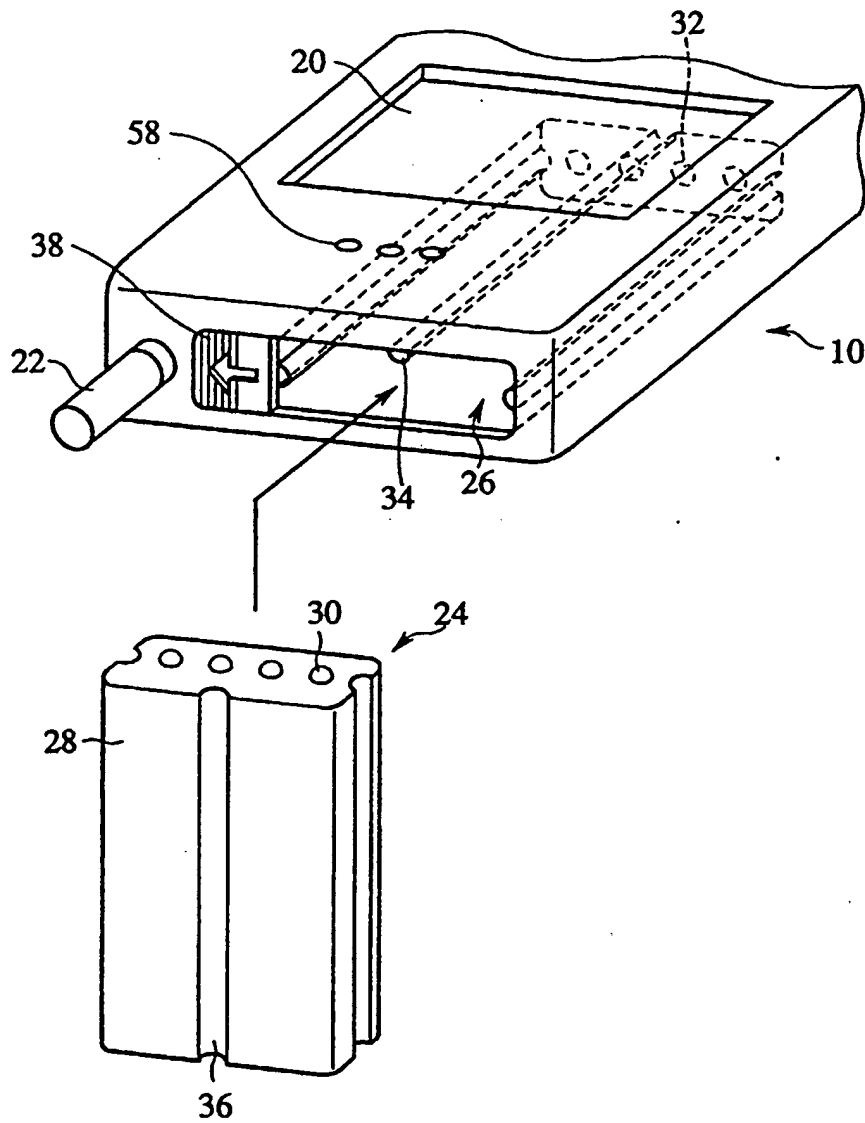


FIG. 3

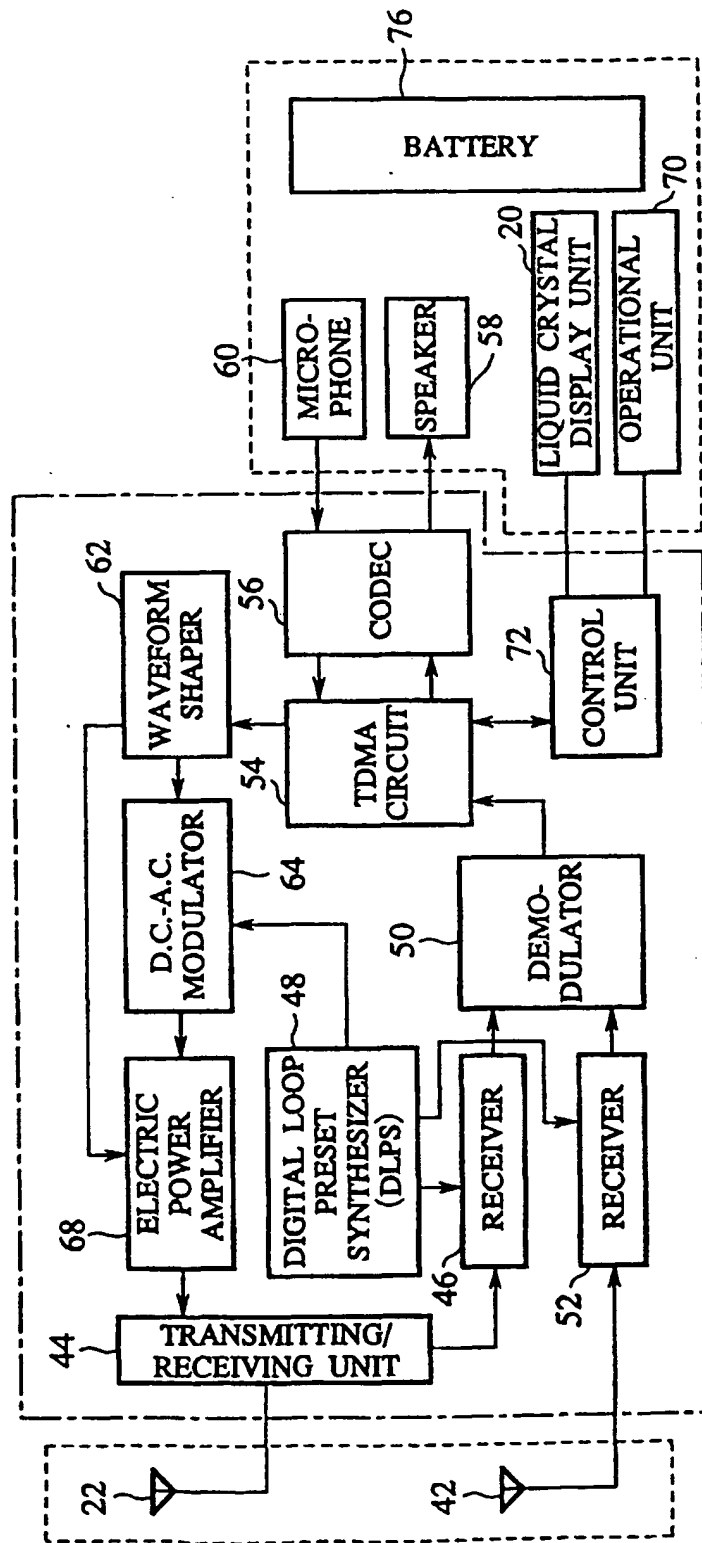


FIG. 4

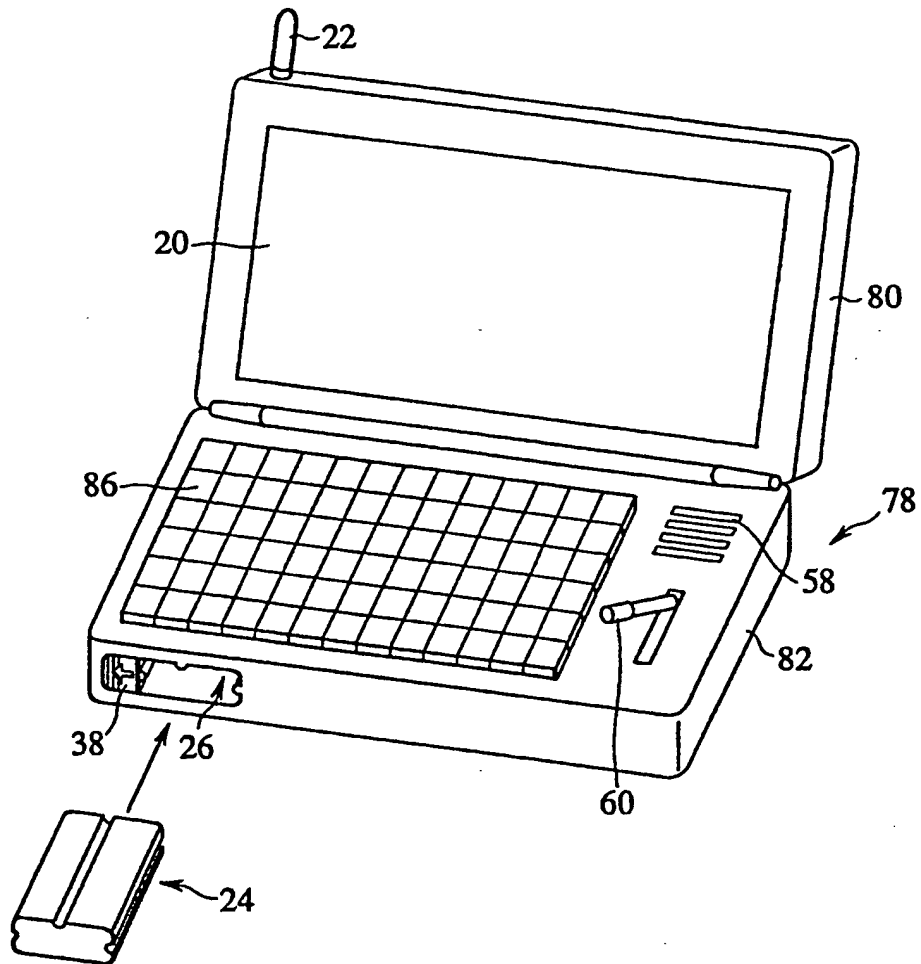


FIG. 5

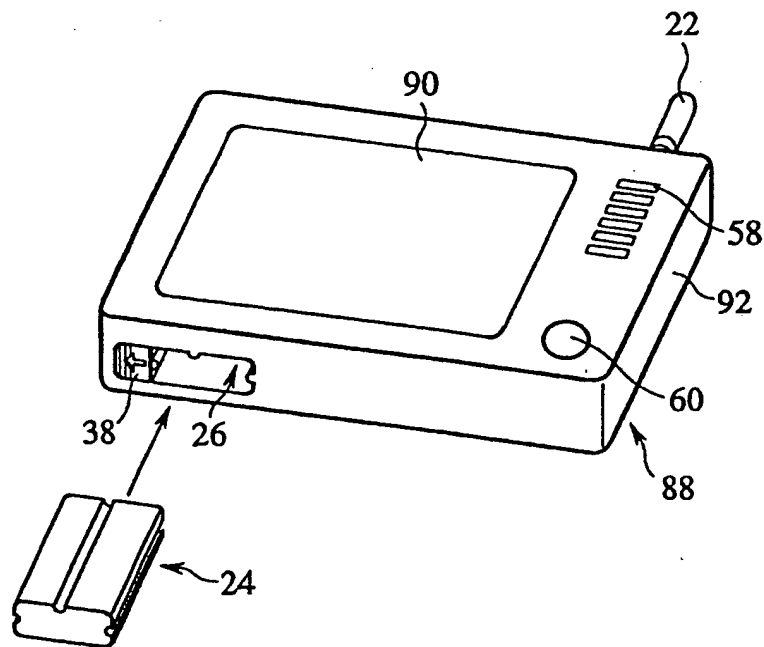


FIG. 6

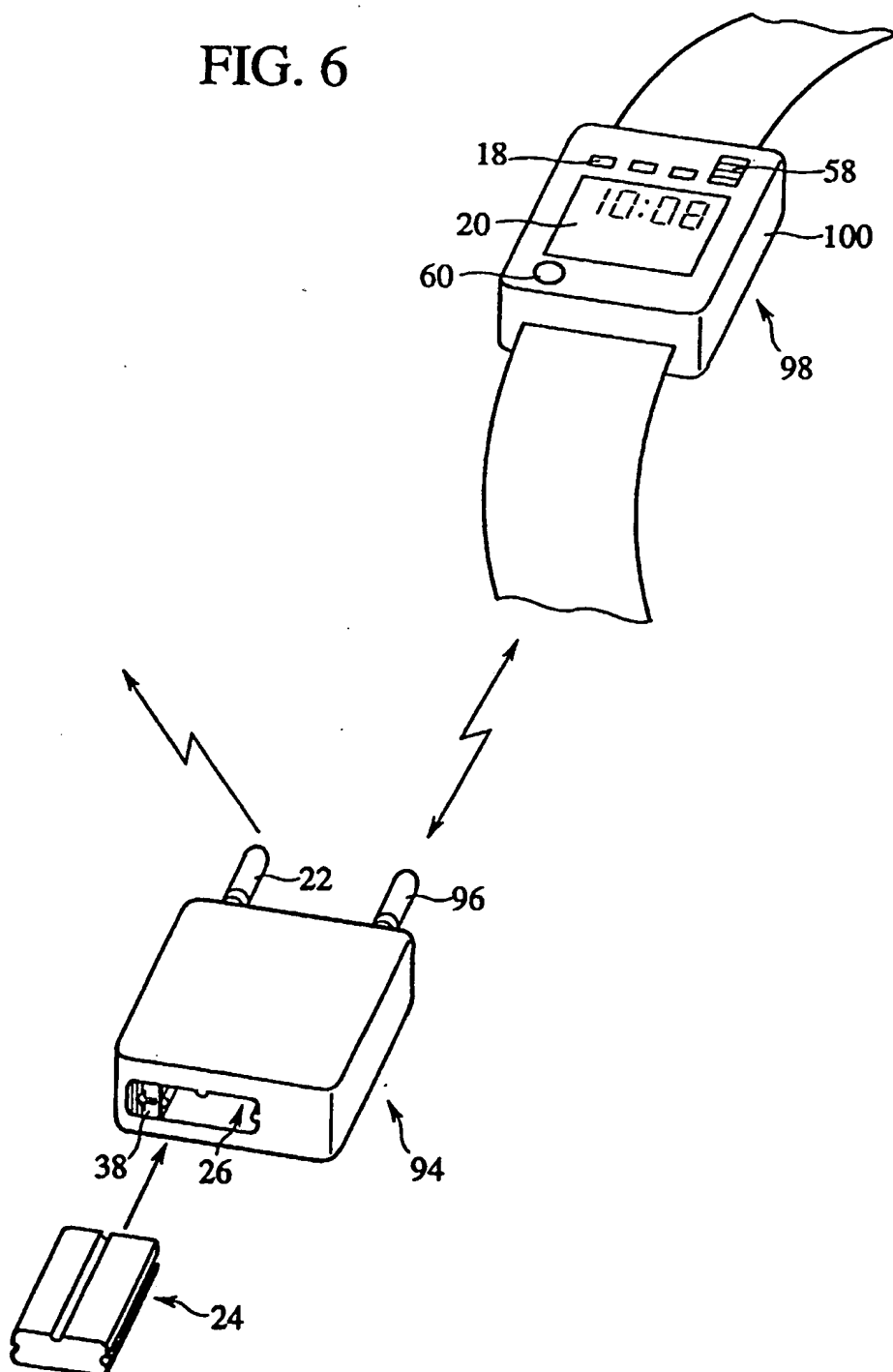




FIG. 7

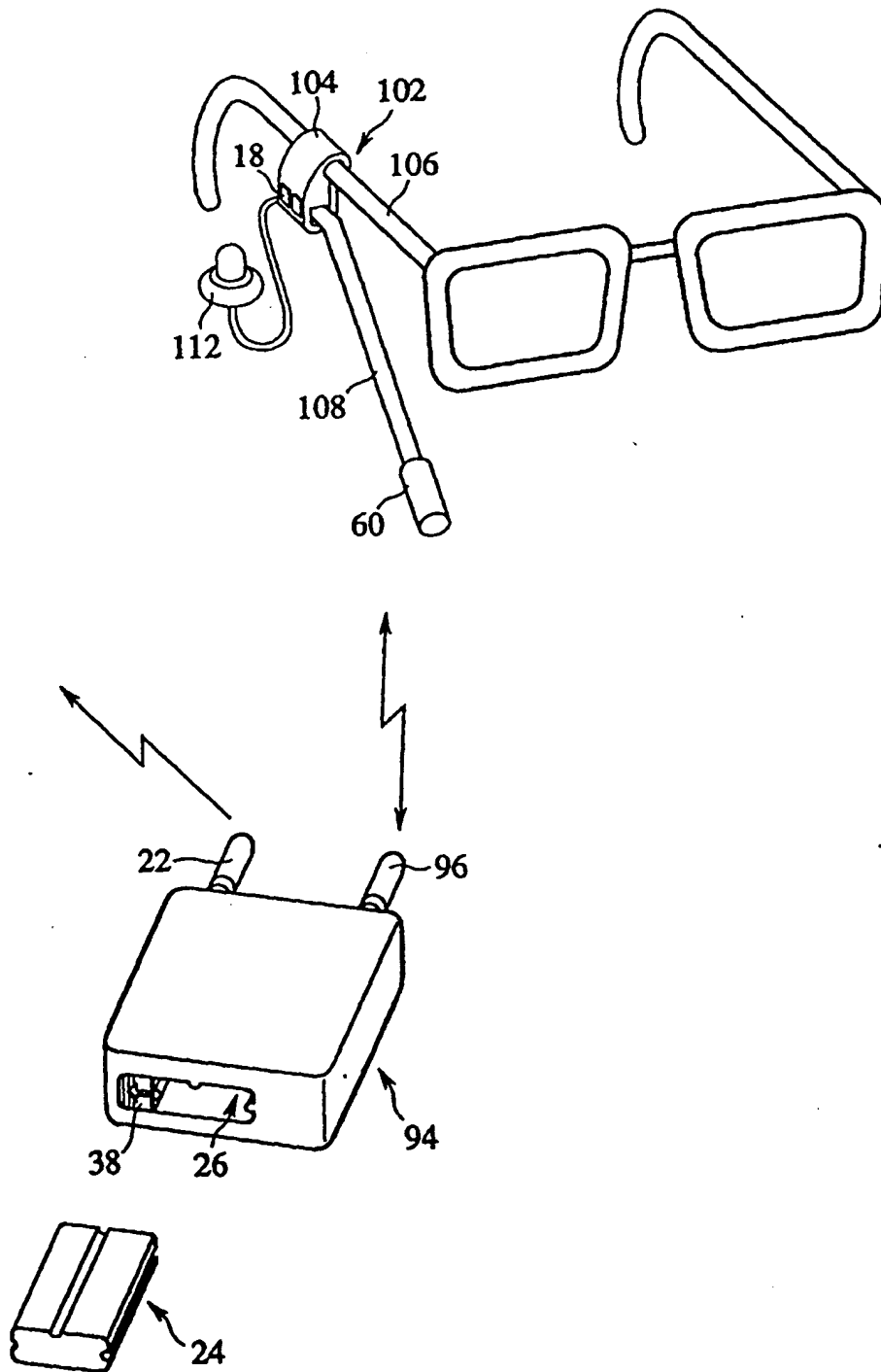


FIG. 8

